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Remarks

Claims 1-32 are pending in the application.

Claims 11, 12, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 11, 12, and 19 have been rewritten so that they no longer depend from a rejected dependent claim and all of the limitations have been included.

Claims 1-8, 13, 15-18, 20-27, and 30-32 are rejected under 35 U.S.C. 102(e) as being anticipated by United States Patent No. 6,330,102 issued to Daneman et al. on December 11, 2001.

Claims 9, 10, 14, 28, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,330,102 issued to Daneman et al. on December 11, 2001.

Each of the various rejections and objections are overcome by amendments which are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments which are presented.

Any amendments to any claim for reasons other than to distinguish such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim in order to distinguish such claim from known prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Attached hereto please find computer red-lined versions of each rewritten paragraph, pursuant to 37 C.F.R. 1.21(b)(iii), and of each claim, pursuant to 37 C.F.R. 1.21(c)(ii).

Rejection Under 35 U.S.C. 102

Claims 1-8, 13, 15-18, 20-27, and 30-32 are rejected under 35 U.S.C. 102(e) as being anticipated by United States Patent No. 6,330,102 issued to Daneman et al. on December 11, 2001.

The Office Action states that Daneman et al. discloses all the limitations of the claimed invention.

Applicants have amended all of the original independent claims to recite that the first and second angles of reflection combine in the same direction so that the combined angle is greater than either of the first or second angle about the specified axis. For example, claim 1 now recites that

> "the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device combine to produce an overall effective angle about said first axis for said group which is greater than either the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device".

By contrast, Daneman et al. teaches that the mirrors of the various MEMS devices that are optically coupled together rotate about mututally orthogonal axes. Thus, the angles of rotation in the coupled MEMS devices of Daneman et al. do not combine in the same direction so that the combined angle is greater than either of the first or second angle about a specified axis, as required by applicants' claims. Consequently, Daneman et al. not only does not teach or suggest applicants' invention, but by requiring the mirrors to tilt about orthogonal axes, Daneman et al. actually teaches away from applicants' invention as defined in applicants' amended claims.

Support for applicants' amendments can be found in applicants' specification as originally filed, for example, at page 2, line 32 to page 3, line 4 and page 3, lines 19-20.

Given the foregoing, applicants' amended claims are allowable Daneman et al. under 35 U.S.C. 102(e).

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Rejection Under 35 U.S.C. 103(a)

Claims 9, 10, 14, 28, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,330,102 issued to Daneman et al. on December 11, 2001.

This ground of rejection is for dependent claims only, and is predicated on the ability to maintain the rejection above under 35 U.S.C. 102(e) given Daneman et al. Since the rejection above under 35 U.S.C. 102(e) over Daneman et al. has been overcome, and the no additional elements are provided by Danemen et al. or suggested in the Office Action regarding the rejection under 35 U.S.C. 103(a), this ground of rejection cannot be maintained, because the rejected claims depend from independent claims which are allowable.

Therefore, claims 9, 10, 14, 28, and 29 are allowable over Daneman et al. under 35 U.S.C. 103(a).

Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, he is invited to call applicant's attorney so that arrangements may be made to discuss and resolve any such issues.

In the event that an extension of time is required for this amendment to be considered timely, and a petition therefor does not otherwise accompany this amendment, any necessary extension of time is hereby petitioned for, and the Commissioner is authorized to charge the appropriate cost of such petition to the **Lucent Technologies Deposit Account No. 12-2325**.

Respectfully,

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By _____
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Lucent Technologies Inc.

Date: November 21, 2002

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231 on November 21, 2002
(Date of Deposit)
Tamika Gatson 11/21/02
Date

MARKED-UP VERSIONS OF THE AMENDED CLAIMS

IN THE CLAIMS

Replacement claim 1

1. An optical switch, comprising

a first micro-electro mechanical system (MEMS) device containing a first number of micro mirrors tiltable about at least a first axis;

a second micro-electromechanical system (MEMS) device containing a second number of micro mirrors tiltable about at least said first axis; and

a first imaging system optically coupled to said first MEMS device so as to produce an image of each of said micro mirrors of said first MEMS device on a corresponding micro mirror of said second MEMS device;

~~whereby~~ so that at least one of said micro mirrors of said first MEMS device is grouped with at least one of said micro mirrors of said second MEMS device such that the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device combine to produce an overall effective angle about said first axis for said group which is greater than either the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device.

Unchanged claim 2

2. The invention as defined in claim 1 wherein said first number and said second number are the same.

Unchanged claim 3

3. The invention as defined in claim 1 further comprising a plurality of optical source coupled to supply input light to said first MEMS device.

Unchanged claim 4

4. The invention as defined in claim 1 further comprising a plurality of optical source coupled to supply input light to said first MEMS device, wherein at least one of said optical sources are one of the group consisting of an optical fiber, a laser. a light emitting diode, light source, and a planar wave guide.

Unchanged claim 5

5. The invention as defined in claim 1 further comprising a receiver coupled to receive output light from said second MEMS device.

Unchanged claim 6

6. The invention as defined in claim 1 further comprising a receiver coupled to receive output light from said second MEMS device, each of said receiver being one of the group consisting of an optical fiber, a photo detector, and a planar wave guide.

Unchanged claim 7

7. The invention as defined in claim 1 wherein said first imaging system reproduces an angle of reflection of the light from each of said micro mirrors of said first MEMS device

Unchanged claim 8

8. The invention as defined in claim 1 wherein said overall effective angle for said group is a sum of said angle of reflection from each of said micro mirrors of said group.

Unchanged claim 9

9. The invention as defined in claim 1 further comprising a field lens for receiving light reflected by said second MEMS device.

Unchanged claim 10

10. The invention as defined in claim 1 further comprising a field lens through which light passes prior to being incident onto said first MEMS device.

Replacement claim 11

11. ~~The invention as defined in claim 1 further comprising~~
An optical switch, comprising
a first micro-electro mechanical system (MEMS) device containing a first number of micro mirrors;
a second micro-electromechanical system (MEMS) device containing a second number of micro mirrors; and
a first imaging system optically coupled to said first MEMS device so as to produce an image of each of said micro mirrors of said first MEMS device on a corresponding micro mirror of said second MEMS device; and
a mirror for receiving light reflected by said second MEMS device and reflecting said light back toward said second MEMS device;
whereby at least one of said micro mirrors of said first MEMS device is grouped with at least one of said micro mirrors of said second MEMS device such that the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device combine to produce an overall effective angle for said group.

Unchanged claim 12

12. The invention as defined in claim 11 wherein said mirror is of a type selected from the group of types consisting of: planar and curved.

Unchanged claim 13

13. The invention as defined in claim 1 wherein said first number of micro mirrors and said second number of micro mirrors are the same.

Unchanged claim 14

14. The invention as defined in claim 1 wherein said first number of micro mirrors and said second number of micro mirrors are different.

Unchanged claim 15

15. The invention as defined in claim 1 wherein the size of said micro mirrors of said first device is the same as the size of said micro mirrors of said second device.

Unchanged claim 16

16. The invention as defined in claim 1 wherein the size of said micro mirrors of said first device is the same different than the size of said micro mirrors of said second device.

Unchanged claim 17

17. The invention as defined in claim 1 wherein said imaging system is a telecentric system.

Unchanged claim 18

18. The invention as defined in claim 1 further comprising

a third micro-electromechanical system (MEMS) device containing a third number of micro mirrors;

a fourth micro-electromechanical system (MEMS) device containing a fourth number of micro mirrors; and

a second imaging system optically coupled to said third MEMS device so as to produce an image of each of said micro mirrors of said third MEMS device on a corresponding micro mirror of said fourth MEMS device;

whereby at least one of said micro mirrors of said third MEMS device is grouped with at least one of said micro mirrors of said fourth MEMS device such that the angle of reflection from said at least one grouped micro mirror of said third MEMS device and the angle of reflection from said at least one grouped micro mirror of said fourth MEMS device combine to produce an overall effective angle for said group of micro mirrors of said third and fourth MEMS devices.

Unchanged claim 19

19. ~~The invention as defined in claim 1 further comprising:~~

An optical switch, comprising

a first micro-electro mechanical system (MEMS) device containing a first number of micro mirrors;

a second micro-electromechanical system (MEMS) device containing a second number of micro mirrors;

a first imaging system optically coupled to said first MEMS device so as to produce an image of each of said micro mirrors of said first MEMS device on a corresponding micro mirror of said second MEMS device; and

a third micro-electromechanical system (MEMS) device containing a third number of micro mirrors;

whereby at least one of said micro mirrors of said first MEMS device is grouped with at least one of said micro mirrors of said second MEMS device such that the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device combine to produce an overall effective angle for said group;

and wherein light reflected by said micro mirrors of said third MEMS device is coupled to said first MEMS device.

Unchanged claim 20

20. The invention as defined in claim 1 further comprising:

a third micro-electromechanical system (MEMS) device containing a third number of micro mirrors;

and wherein light reflected by said micro mirrors of said second MEMS device is coupled to said third MEMS device.

Unchanged claim 21

21. The invention as defined in claim 1 wherein said micro mirrors of said first MEMS device are adapted to tilt substantially only around a first tilt axis and said micro mirrors of said second MEMS device are adapted to tilt substantially only around a second tilt axis that is substantially orthogonal to said first tilt axis.

Unchanged claim 22

22. The invention as defined in claim 1 wherein said first MEMS device is arranged to act as a booster.

Unchanged claim 23

23. The invention as defined in claim 1 wherein each of said grouped micro mirrors effectively contribute different angles to said overall effective angle for said group.

Unchanged claim 24

24. The invention as defined in claim 1 wherein one of each of said grouped micro mirrors effectuates coarse tilt and the other effectuates fine control.

Unchanged claim 25

25. The invention as defined in claim 1 wherein said micro mirrors of one of said first and second MEMS devices is arranged so that they can be only flat or maximally tilted in at least on direction around at least one tilt axis.

Unchanged claim 26

26. The invention as defined in claim 1 wherein said micro mirrors of one of said first and second MEMS devices is arranged so that they can be only maximally tilted in at least on direction around at least one tilt axis.

Replacement claim 27

27. A method for operating an optical switch including a first micro-electromechanical system (MEMS) device containing a first number of micro mirrors tiltable about at least a first axis, a second micro-electromechanical system (MEMS) device containing a second number of micro mirrors tiltable about at least said first axis, the method comprising the step of:

imaging said first optical MEMS device onto said second optical MEMS device so that the angle of reflection from at least one micro mirror of said first optical MEMS device and the angle of reflection from at least one micro mirror of said second MEMS device combine to produce an overall effective angle about at least said first axis when considering said least one micro mirror of said first optical MEMS device and said at least one micro mirror of said second MEMS device as a group, said overall effective angle being greater than either the angle of reflection from said at least one grouped micro mirror of said first MEMS device and the angle of reflection from said at least one grouped micro mirror of said second MEMS device.

Unchanged claim 28

28. The invention as defined in claim 27 further comprising the step of passing light from said second optical MEMS device through a field lens.

Unchanged claim 29

29. The invention as defined in claim 27 further comprising the step of receiving light from a field lens at said first optical MEMS device.

Unchanged claim 30

30. The invention as defined in claim 27 further comprising the step of coupling light passed from a fiber at said first optical MEMS device.

Unchanged claim 31

31. The invention as defined in claim 27 further comprising the step of coupling light from said second optical MEMS device to a fiber.

Replacement claim 32

32. An optical switch, comprising

a first micro reflective means mounted on a first micro-electromechanical system (MEMS) means tiltable about at least a first axis;

a second micro reflective means mounted on a second micro-electromechanical system (MEMS) means tiltable about at least said first axis;

a first imaging means optically arranged to produce an image of said first micro reflective means at said second micro reflective means such that the angle of reflection of said first micro reflective means and the angle of reflection from said second micro reflective means combine about said first axis to produce an overall effective reflective angle~~d~~ that is greater than either the angle of reflection of said first micro reflective means and the angle of reflection from said at least second micro reflective means.